Promotors or Champions? Pros and cons of the division of labour for economic progress

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Abstract

According to the Great-Man Theory, the creation of something new used to be accredited solely to one outstanding individual: the champion. This prevailing notion in Anglo-American research was first challenged by Witte (1973), who concluded that an innovation cannot be a one-man decision, since the creation of something new usually involves highly complex and multi-person decision processes. Witte's model credits the success not to one all-around individual, but to the cooperation of several different specialized persons (so called promotors). Even though the Great-Man Theory is still leading the discussion, the idea of specialized promotors should not be underestimated. In this article we discuss the circumstances under which specialized promotors or generalized champions are better suited for economic progress. We find extensive empirical proof for both roles.

JEL-Classification: M12, O32.

Keywords: Champions; Promotors.

1 Introduction

In the 1970's, Eberhard Witte developed the idea of promotors. He defined promotors as "individuals who actively and intensively support the innovation process" (Witte (1973, 15-16)). Witte started by asking how economic progress develops. Technological inventions, i.e., new products, production materials, or production processes, might or might not generate economic value (Walter (1998, 37)). Based on the question of how economic progress develops, Witte identified barriers against innovation that hinder economic progress. These barriers can severely handicap or even prevent innovation altogether if they are

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not overcome by the organization. Witte assumed that since these barriers are created by people who either do not want the innovation or are not capable of implementing it, then only people can overcome these barriers. Witte's concept assigns the success of an innovation not only to one all-around "star", but also to the cooperation of several different kinds of specialized promotors (Hauschildt (2004, 197)).

Admittedly Witte's concept of specialized promotors conflicts with the Great-Man Theory of generalized champions. In this tradition, the success of an innovation used to be accredited solely to one outstanding individual, who was called champion (Hauschildt (2004, 195)). Witte challenged this general belief of a single person's actions. He argued that innovation processes involve very complex and multi-person decision processes that cannot be borne by only one individual. However, so far, the promoter concept has not been too successful in Anglo-American research, as the Great-Man Theory is still leading the discussion (Research on champions, e.g., Schon (1963); Chakrabarti (1974); Achilladelis et al. (1971); Burgelman (1983); Roberts and Fusfeld (1988); Frost and Egri (1991); Day (1994); Dougherty and Hardy (1996); Howell and Higgins (1990); Howell et al. (2005), Lam (2005)). Since there is extensive empirical proof for both promotors as well as champions, we discuss the circumstances under which specialized promotors or generalized champions are more suited for economic progress (Research on promotors, e.g., Witte (1973); Gemünden (1985); Gierschner (1991); Gemünden and Walter (1996); Hauschildt and Kirchmann (1997); Klöter (1997); Walter (1998); Folkerts (2001); Folkerts and Hauschildt (2002), Gemünden and Hölzle (2005)).

2 The Model of Specialized Promotors

2.1 Witte's Two-Center Theory of Power and Know-how

Innovations are changes signifying that old "traditions" are disappearing and "something new" has to be accepted. If these changes "… developed automatically and more or less on its own, without encountering any personnel or technical barriers, no specific organizational structure encouraging innovation would be required. But we cannot simply take it for granted that, once the problems of decision-making are mastered intellectually, the rational solution will be immediately understood and implemented by the competent authorities. Indeed, empirical studies have shown that innovation decision-making problems can be solved only by complex, multi-personnel and multi-operational decision-making processes. …." (Witte (1973, 48-49)). Because innovations cause decision-making problems, they often lead to the resistance by employees. These problems arise from the uncertainty of the new situation and are expressed as the wish to maintain the status quo (Witte (1973, 7); March and Simon (1958)). "…The new is quite usually synonymous with the unreasonable, the dangerous, the impossible…" (Kallen (1973, 450)). Barriers delay or even prevent the implementation of new ideas (Witte (1973, 6)). Employees express their resistance against innovations by their attitude or motivation towards the "new."[1] Most employees have no reason to support the innovation, as the previous behavior

1 *Witte* (1973, 5ff.) calls these motivational barriers to willingness, i.e., not willing.

patterns were successful and they cannot predict what the new situation will be like, or what advantages and disadvantages will be connected to it (Hauschildt (2004, 175)). The "new" can also lead to cognitive resistance[2]: many employees seem incapable of giving up previous knowledge and painfully acquired experiences, particularly since the objectives concerning the innovation are too fuzzy (Hauschildt (2004, 175)). Thus, the progress of innovation depends on the employees' willingness and ability to cooperate.

Barriers, i.e., rejection, ignorance, or opposition, appear in the form of people who either do not want the innovation or are not capable of implementing it. Consequently, to surmount these barriers, organizations need persons who can start the innovation process and keep it going on until a final decision is reached. Witte called these people promotors. Promotors are those individuals who actively and enthusiastically promote innovations throughout the crucial organizational stages.

Because the problem-solving capacities of every human are limited, different actors have different previous knowledge (Bandura (1976); Rumelhart (1980); Dosi, Nelson, and Winter (2000)). Actors can only consider those goals and alternatives for a problem's solution that correspond to their previous knowledge (March and Simon (1958)). It seems plausible that the kind of previous knowledge an individual has influences the problem-solving capacity of that person and their recognition of barriers during these search efforts. Therefore, Witte postulates that activities to overcome barriers in the innovation process are contributed by different specialized persons, i.e., from employees with different previous knowledge. Witte differentiates between two kinds of specialization, the "power promoter" and the "expert promoter" and bases this distinction on the following assumptions.

(1) *Correspondence between barriers and contributions.* In each organization there is a correspondence between the resistance of some employees and the resistance-overcoming contributions of other employees. The motivational resistance of some employees is recognized and overcome by the hierarchical potential of other employees. The cognitive resistance of some employees is recognized and overcome by the expert knowledge of other employees.

(2.) *Role specialization of the contributor.* The contributions to overcoming the resistance of some employees are made by specialized persons. The "power promoter" contributes through hierarchical power and the "expert promoter" contributes through expert knowledge.

(3.) *Promoter cooperation.* The innovation process will be successful if both specialized promotors work closely together (Hauschildt and Kirchmann (1997, 68)).

Because changes need the cooperativeness of employees, *"power promoters"* actively foster the innovation process by means of hierarchical power. (Witte (1973, 17)). The defining characteristics of the power promoter are a certain position within the organizational

2 Cognitive barriers are called ability barriers or barriers of not knowing. See Witte (1973, 5ff.).

structure and a certain type of behavior. Power promotors recognize barriers, sanction antagonists, and support and protect innovation-enthusiastic employees based on their hierarchical position (Shepard (1967, 471)).

"Expert Promotors" actively encourage the innovation process by means of specific knowledge (Witte (1973, 18)). Usually, this promoter has a line function in a department that closely connected with the innovation. The expert promoter may become aware of the potential innovation by recognizing weaknesses within the daily work routine. These promotors also help to overcome employees' cognitive barriers by recognizing problems. To do so, they use their extraordinary specific expert knowledge, since many employees lack the cognitive prerequisites to find specific problem solutions or to engage in multidisciplinary interactions with others (Walter (1998, 60)). Expert promotors also assist other employees to understand new problems and use their expert knowledge as argument against antagonists. For this reason, a solitary scientist is not an expert promoter, because such a person does not motivate others to work for an innovation.

These two kinds of promotors must be understood as normative role types. Both explain social roles of actors, i.e., an abstract bundle of abilities, social behaviors, and motives for action (Fuchs-Heinritz et al. (1995); Wiswede (2004, 1289ff.)). However, reality does not always correspond to these theoretical role concepts.

2.2 Extension of the Promoter-Concept

In the 1990s, Hauschildt and Chakrabarti discovered a third barrier that can hinder economic progress: administrative barriers (Hauschildt and Chakrabarti (1988, 378-388)). These barriers emerge in those organizations that are predominantly run by routines, for example, by a risk-averse financial controlling philosophy (Hauschildt and Gemünden (1999, 93)). Moreover, cooperation barriers (Allen (1967); Allen et al. (1979)) and dependency barriers (Gemünden and Walter (1995)) prevent innovations. Cooperation barriers result from significant mental, language, and intercultural distance between employees. Dependency barriers are caused by a disequilibrium in relationships. Sometimes, and especially in changing situations, the asymmetric power of relationships may be used to dictate activities to the other party or to prevent activities.

Because Witte assumed that there does exist a correspondence between the resistance of some employees and the resistance-overcoming contributions of other employees, other studies specify additional contributions. Administrative barriers can be recognized and overcome by organizational knowledge, cooperation barriers by socialization, and dependency barriers by network competence (Gemünden and Ritter (2003)). Based on Witte's assumption of role specialization, these contributions are made by specialized persons. "Process promotors" possess organizational knowledge, technological gatekeepers[3]

3 The technological gatekeeper – one of the oldest roles of innovation management – is often not represented by the promoter concept. We add the technological gatekeeper as fifth specialized role, since these specific contributions are not expressed in the promoter concept.

contribute to the socialization of teams, and "relationship promotors" add their network competence to innovation processes.

"Process promotors" actively arbitrate between the technical and economic world by means of organizational knowledge (Hauschildt (2004, 213f.); Hauschildt and Chakrabarti (1988, 385f.)). Since innovations not only affect the innovating department but also influence other departments in the organization, economic progress needs both the good will of the immediate participants and also the good will of the affected actors. Process promotors overcome administrative barriers by recognizing organizational hurdles (Hauschildt and Chakrabarti (1988, 378ff.); Hauschildt and Kirchmann (1997, 69); Hauschildt and Schewe (1997, 509)). The defining characteristics of the process promoter is his or her role in interfacing within the organizational structure, e.g., as project leader. Based on their negotiation skills, the process promoter mediates between involved and affected parties (Hauschildt (2004, 213)).

Technological Gatekeepers actively support cross-organizational knowledge transfer (Allen (1967, 35; 1977, 141ff.)). The defining characteristics of the gatekeepers are their technological competence and their cross-organizational relationships with other scientists. Innovations often derive from the combination of external information with internal knowledge. However, external information is often unconsciously ignored, suppressed, forgotten, distorted, or seen and commented on in a prejudiced way (Nisbett and Ross (1980); Janis (1972); Mehrwald (1999)). Gatekeepers overcome these barriers by recognizing relevant information and communicating this information to their colleagues: ... gatekeepers are among the organization's highest technical performers..." (See Allen (1977; 171)). Gatekeepers often start socialization processes in work groups, i.e., they help to overcome significant mental, language, and intercultural distances between members of different organisations (Katz and Tushman (1981)).

"Relationship promotors" actively encourage an innovation process by means of innovation-related business relationships inside and between the organization and its external partners (Gemünden and Walter (1995, 971, 974). The defining characteristic of relationship promotors is their extensive network competence, i.e., powerful relationships with other parties. Sometimes employees do not want to share knowledge, for example, because they dislike or envy one another. Relationship promotors overcome dependency barriers by recognizing knowledge transfer barriers and initiate, design, and foster relationships to important actors and third parties (Gemünden and Walter (1996, 273ff.).

3 Great-Man Theory of the Champion

Contrary to the promoter-concept, champion research is looking for generalists who play multiple roles (Schon (1963); Achilladelis et al. (1971); Chakrabarti (1974); Rothwell et al. (1974); Burgelman (1983); Howell and Higgins (1990); Frost and Egri (1991); Day (1994); Dougherty and Hardy (1996)). Champions are "individuals who informally emerge to actively and enthusiastically promote innovations through the crucial organizational stages" (Howell et al. (2005, 642)). Champion research often refers to this general definition without defining precise role attributes of the champion: “Most of what has been reported about champions is largely anecdotal, reflecting the researcher’s impressions, rather than reliable and valid measurement using well accepted instruments” (Howell et al. (2005, 644)). Schon describes champions based on the attributes of informal selling, innovative ideas, informal power, reliability, and heroic qualities (Schon (1963)). Burgelman adds that champions mobilize forgotten ideas and launch these ideas by communicating with the top management (Burgelmann (1983)). Moreover, champions act in concert with other stakeholders for a common achievement of objectives (Galbraith (1982); Markham and Griffin (1998); Shane (1994)). Howell et al. attempt to close the research gap in the champion literature by specifying precise behaviours of the champion role. Unfortunately, the results are imprecise, just as we would expect for an all-round champion role concept. The authors conclude that champions belong to middle management, and possess enthusiasm, persistence, and network competence (Howell et al. (2005)).

Ultimately, the champion role, i.e., the universal promoter, corresponds with Witte’s personal union. Witte mentions in his research that promoter roles can be combined in one role. The personal union of the power and expert promotors refers to a person who actively promotes an innovation process by using both hierarchic potential and object-specific know-how. In Witte’s sense, the concentration of promoter roles is inferior to the team of independent promotors, because a one-man decision cannot offset a two-man decision (Witte (1973, 21)). Furthermore, Hauschildt and Kirchmann also supports the notion of specialized promotors as being the most efficient for complex processes like innovations (Hauschildt and Kirchmann (1997, 71)).

4 Promotors or Champions?

In a sense, not only specialized promotors are suited for economic progress, as but the Anglo-American literature still favors and empirically confirms the champion. In fact, this *contradiction* in innovation research makes sense as promotors or champions are hardly observable. These work roles informally emerge to actively and enthusiastically promote innovations, but are not a part of the employment agreement. Research in organizations often finds empirical confirmation for promotors and champions. Therefore, both kinds of individuals must be an integral part of innovation processes. It also does not seem feasible that cultural differences lead to the description of an all-rounder in the Anglo-American area and to the specialist in the German area. We believe that both types appear. However, it remains unclear under which circumstances champions or specialists foster economic progress.

Research shows that the cognitive abilities of each person are limited (Ellis (1965); Estes (1970); Pirolli and Anderson (1985)). Consequently, innovation experts have only two possibilities for using their abilities: specialization or generalization. Specialization implies that all cognitive abilities of a person are predominantly allocated to one field of knowledge (component knowledge) (Henderson (1996, 370)), but at the same time, this allocation limits the cognitive abilities in other related areas of knowledge (architectural knowledge) (Henderson (1996, 370)). As we noted earlier, specialization corresponds with the promoter concept, which postulates that activities in the innovation process are contributed from different specialized persons. Generalization implies a more balanced distribution of the sum of all cognitive abilities of a person in multiple fields of knowledge (architectural knowledge), but synchronous implies less-deep knowledge in one field (component knowledge). Generalization is the equivalent of the concentration of work roles in the champion concept, that is, the all-embracing previous knowledge of one employee in different areas.

The distinction between component and architectural knowledge, or between the specialization and generalization of the cognitive abilities of a person, underscores the idea that successful innovation requires two types of knowledge. First, a successful innovator requires deep or basic knowledge about the product as a set of components. For example, a car's major components include the motor, the control system, and the mechanical housing. Second, a successful innovator requires broad knowledge about the ways in which the components are linked together into a coherent whole. For example, the decision to use an electric motor instead of a gasoline engine establishes the product as a system (Henderson and Clark (1990)).

The advantages of both kinds of knowledge depend on the kind of economic progress that can be attained by refining and improving an existing design or by introducing a new concept that differs in a significant way from past practice (Mansfield (1968)). Incremental innovation introduces relatively minor changes to the existing product and exploits the potential of the established system of components (Nelson and Winter (1982); Tushman and Anderson (1986)). Although incremental innovation does not draw from a dramatically new science, it often calls for considerable new skills because employees must build on previous knowledge. Over time, incremental innovations might have significant economic consequences (Hollander, 1965). In contrast, radical innovation often introduces major changes and explores the potential of a new system of components. Radical innovation is based on a different set of engineering, scientific, and economic principles. It often calls for broad knowledge in multiple fields and opens up new applications, new markets, or even redefines an industry (Tushman and Anderson (1986), Henderson and Clark (1990)).

Radical innovation creates unmistakable challenges, since it often destroys the usefulness of established knowledge. For example, once the dominant automobile design had been accepted, engineers did not re-evaluate the decision to use a gasoline engine in every subsequent design, because incremental innovation only refines and elaborates on the initial set of components. The emergence of a radical new technology is usually a period of considerable confusion. Recognizing what is useful and what is not, and acquiring and applying new knowledge when necessary, may be difficult. There is little agreement about what the major components of the product should be or how they should be put together (Clark (1985)). Therefore, radical changes lead to even stronger decision-making problems between the diverse parties and increase the barriers against innovations.

For radical changes, research recommends an overlap of the problem solving capabilities of persons who act jointly, i.e., architectural knowledge (Langlois (1992); Spender

(1993); Nooteboom (2000)). Architectural or general knowledge implies that employees not only have deep knowledge in one field, but are also well educated in other areas. For this reason, they are better able to see problem solutions from different viewpoints and to agree about what the major components of the new product should be or how they should be put together. For example, industrial engineers have engineering and business skills and are able to see problem solutions from the viewpoint of both an engineer and a manager. The champion also has a high amount of architectural or general knowledge. Therefore, generalized champions should be better positioned to reduce the barriers against radical innovation, i.e., to reduce the decision-making problems between the diverse parties. The findings of Folkerts and Hauschildt support this assumption. The authors observed that champions are the most useful to promote radical innovation (Folkerts and Hauschildt (2002, 11)). The idea that all-rounders are better suited for radical innovation is also supported by the concepts of the "t-shaped employee" (Leonard-Barton (1998); Carlile (2004)) and of the interpersonal diversity (Bunderson and Sutcliffe (2002)). In the case of radical innovation, the cited research shows that both concepts foster economic progress. The assumption that all-rounders are better suited for radical innovation could also explain why Anglo-American studies only consider the champion. Most research deals with radical rather than incremental technological change.

Since success in the market not only builds on the synthesis of unfamiliar technologies for creative new designs, organizations must actively develop knowledge about new ways in which components could be linked together and basic knowledge about the product as a set of components. For example, electric-powered cars as a technology of choice encourage organizations to learn more about electric-fired engines. Therefore, successful organizations adjust their attention between learning a great deal about a new design and learning a little bit more about the old design. In the case of incremental change, employees must build on their earlier knowledge, since incremental innovation creates a scarce source of existing, mostly slightly changed knowledge.

As employees build on existing knowledge, incremental changes lead to fewer decision-making problems between the diverse parties. Many employees have comparable skills from existing knowledge, e.g., from education or former experiences (Polanyi (1985)). Moreover, existing knowledge can be better phrased and reproduced. Existing knowledge also helps to build common understanding between employees with different educational backgrounds and skills. However, if knowledge has been accepted, it looses its competitive advantages. Knowledge about the product as a set of components is more likely to be managed explicitly and can easily be imitated (Barney (1991)). Organizations that are actively engaged in incremental innovation thus only achieve comparative advantages if they are specialized, i.e. if they make use of the division of labour (Chandler (1990, 593); Milgrom and Roberts (1992); Foss and Iversen (1997); Kräkel (2002); Frese (2002)).

Specialization and the division of labor are in line with the promoter concept. In advanced technologies specialized employees with deep basic knowledge, i.e., component knowledge, recognize opportunities better than do generalized employees with broad marginal knowledge, i.e., architectural knowledge, which explains why champions are less suited to reducing the barriers against incremental innovation. They cannot see problem solutions by refining and improving an existing design, and therefore are not able to agree on what the minor changes to the existing product should be or how the established system of components should be exploits.

In summary, the contributions of promotors and champions to surmounting barriers depend on the kind of economic progress within an industry or an area. If economic progress builds on previous knowledge and organizations only need to refine and improve an existing design, the specialized promotors are more suitable. If economic progress cannot be built on previous knowledge and organizations must introduce a new concept that differs in significant ways from past practice, then generalized champions are more suitable.

To test these assumptions, we measure how promotors or champions influence the innovation output of other employees.

Hypothesis:
The higher the previous knowledge of an organization in one technology area and the greater the extent of improvements of existing designs within this technology area, the better suited are specialized promotors to increase the innovation output of other employees

The less the previous knowledge of an organization in one technology area and the greater the extent of uncertainty within this technology area, the better suited are generalized champions to increase the innovation output of other employees.

5 Method

5.1 Sample

We conducted a survey in the automotive industry. We chose the automotive industry because it is characterized by both incremental and radical technological changes (Tietze (2003). We explore only one industry, since the amount and quality of new knowledge is dependent on the sector (Michel and Bettels (2001); Harhoff and Reitzig (2001)). To acquire an adequate sample we used the population of all European (EP-) patents granted to German automotive companies from 1990-1999 and drew a random sample using the snowball procedure. The random sample consists of 1287 EP-patent families (in the following called EP-patents) of 533 inventors from 69 different companies. Using the technology classes of the patents, we looked at whether the selected sample mirrored the population of all patents. There were no significant differences[4].

Next, we contacted the 533 inventors by mail and, if possible, by phone. We excluded 147 inventors from the analysis because of movement, pension, or death. Overall, 386

4 Michel and Bettels (2001); Harhoff, Scherer, and Vopel (2003) show that knowledge rate of returns in different industries are not comparable. The snowball procedure started with cooperation patents of big automotive manufacturers.

persons were directly accessible. From this final sample 142 filled-out questionnaires were returned, yielding a response rate of 36%. On the basis of different indicators, i.e., the technology classes, firm affiliation, application date of a patent, number of EP patents per inventor, and the answer date, we examined whether the return rate mirrored the selected sample of the 533 inventors. We found that the differences between participants and non-participants were not significant, i.e., random[5].

5.2 Measurements

The method of egocentric network analysis was used to identify promotors and champions. An egocentric network consists of the Alteri, i.e., the personal contacts of the interviewed person[6]. To select relevant Alteri from all contacts of a person, this method uses specific questions, so-called name generators. One example of a name generator is the naming of all network partners with whom the interviewed person shares knowledge. The respondent quotes his network partners via name codes, e.g., the network partner "Otto Baum" is specified by the name code "OB". Later, we identify network partners who have been named by two respondents. In our study, the participants could indicate a maximum of eight network partners per each name generator. Overall, we used 15 different name generators. In total, we identified 1,905 job-related network partners of the 142 respondents.

Identification of work roles. We used five name generators to identify different network partners who were widely acknowledged in the organization as innovation experts and who were thought to actively and enthusiastically promote innovations through the crucial organizational stages (Walter (1998); Hauschildt and Gemünden (1999); Folkerts and Hauschildt (2002)). We asked for the work roles of the promoter concept, i.e., the power promoter, expert promoter, process promoter, and the relationship promoter, and the technological gatekeeper. An typical question we used to identify expert promoter was: "Please name those persons in your COMPANY, who - after general understanding – actively encourage an innovation process by means of specific knowledge. In particular, such persons who are proven technical and/or procedure-specific experts in innovation projects and who assist by the development of new

5 We found an average age of 46 years and approximately 21 years of employment. We split these 21 years into 15 years of employment in the actual company and 12 years in the current technology area. The work activity of the participants consisted to 26% of operative, application-oriented activities and to 17% of scientific activities (32%: discussions/meetings, 25%: administrative activities). On average, each participant held 18 patents, 12 new product or process developments, and eight publications. Furthermore, each inventor was five times more involved in non-disclosure activities of his current company and received an average bonus per year of €1500.00 for his inventions.

6 See Wasserman and Faust (1994). Egocentric networks represent the only network approach that permits the researcher to pull a random sample and is therefore compatible with survey research. The free choice of persons – in contrast to the presentation of a list of names – further validates the measurements.

products or procedure." (see footnote 7 for all questions). To check whether our measurements clearly identify informal work roles, we ran a pretest in a small organization. The external validity of the measurements was good, since we were able to clearly identify the same persons over multiple respondents as promotors or champions[8].

In total, we identified 860 informal role owners in the networks of the 142 respondents. The number of role owners per work role are listed in *table 1* (persons with multiple work roles are possible). The expert promoter occurs most frequently in networks and the power promoter occurs most rarely. These results are in line with previous empirical findings (Folkerts and Hauschildt (2002)).

Table 1: Descriptive statistic of informal role owners in ego networks*

Variable	Min.	max.	mean	std.dev.
Informal role types in ego networks				
Expert promoter ($KnwPro_{Alteri}$)	0.00	1.00	0.22	0.41
Power promoter ($PowPro_{Alteri}$)	0.00	1.00	0.15	0.36
Process promoter ($ProPro_{Alteri}$)	0.00	1.00	0.16	0.37
Relationship Promoter ($RelPro_{Alteri}$)	0.00	1.00	0.16	0.36
Technological Gatekeeper ($TecGa_{Alteri}$)	0.00	1.00	0.17	0.38

**N* = 1,905 (multiple work-roles of persons are possible)

7 Please name those persons in your COMPANY, who – after general understanding – :
(1) ... actively encourage an innovation process by means of specific knowledge. In particular, those persons who are proven technical and/or procedure-specific experts in innovation projects and who assist by the development of new products or procedure. (2) ... actively promote an innovation process by means of hierarchic power. In particular, those persons who order sanctions against opponents and provide protection for those who are in favor of innovation. (3) ... actively arbitrate between the technical and economic world by means of organizational knowledge. In particular, those persons who recognize organizational hurdles and contribute to innovation processes through their negotiation capabilities. (4) ... actively encourage an innovation process by means of innovation-related business relationships inside and between the organization. In particular, those persons who initiate, design, and foster relationships to important actors and third parties. (5) ... actively support cross-organizational knowledge transfer. In particular, those persons who assist and help by searching out and evaluating external technical information.

8 We selected one company that develops and tests new production technologies for automotive manufacturers. This company employs 111 employees in eight business units. We asked two employees and one departmental manager from each unit about their egocentric networks. We also talked to the CEOs. In total, we obtained 26 non-anonymous data sets, which allowed an external validation of highly ranked actors in the company. This pretest confirmed with 60% accuracy a high reply consistency between the respondents.

Promotors compared to champions. We followed Witte by measuring promotors as the specialization of a person on only one work role. We measured champions as the concentration of work roles in one person, i.e., the personal union. From the 860 named role owners, 445 persons are specialized on only one work role i.e., promotors, and 415 persons are non-specialized champions. This result stands supports our assumption that both promotors and champions are an integral part of innovation processes.

Specialized promotors and generalized champions. We assume that promotors have a higher amount of component knowledge and that champions have a higher amount of architectural knowledge. We empirically test these assumptions in *table 2.* Overall, the respondents regard champions as technical more similar to themselves as promotors. Thus, champions are more able to play a linking pin between different specialized employees. However, in comparison to champions, promotors are seen as more innovative within a nongeneric technical field. The innovativeness of a person within a nongeneric technical field needs specialist knowledge, which is an indication of a higher amount of component knowledge.

Table 2: Champion's combination knowledge compared to promoter's component knowledge

Promoter/Champion	Technical proximity to the respondent as an indicator for architectural knowledge (1= low, 5 = high)	Outstanding innovativeness in a technical field as an indicator for component knowledge (1 = low, 5 = high)
Promoter (N = 445)	3.54	2.17
Champion with 2 roles (N = 168)	3.76	2.06
Champion with 3 roles (N = 85)	4.12	1.78
Champion with 4 roles (N = 73)	3.96	1.85
Champion with 5 roles (N = 42)	4.37	1.59
F-Value	9.82***	7.61***

Division of labor. According to Witte, different promotors make different specialized contributions within the innovation process. To measure specialized contributions, we used 11 name generators to examine four different kinds of contributions within the innovation process. We distinguish between the exchange of knowledge, the exchange of meaningful opinions, the access to legitimate power, and the exchange of complementary help to achieve objectives. An example question for knowledge exchange was "With which persons, regardless of whether they work inside or outside COMPANY, are you discussing job-related questions, e.g., new product developments or new problem solutions?" (see footnote 9 for all questions). The results in *table 3* overall confirm Witte's assumption. According to these findings the technological gatekeeper and the expert promoter more frequently take part in the exchange of knowledge, the relationship promoter more frequently takes part in the exchange of opinions, the power promoter more frequently opens the access to legitimate power, and the process promoter more frequently assists in complementary contributions to achieve objectives.

Table 3: Specialized contributions of the promotors*

Promoter	Number of transactions to exchange knowledge	Number of transactions to exchange meaningful opinions	Number of transactions to access legitimate power	Number of transactions to exchange complementary help to achieve objectives
Technolog. Gatekeeper (*N* = 94)	**1.16**	.22	.11	.21
Other Promoter (*N* = 351)	.87	.21	**.44**	.28
F-Value	4.18**	.03	17.50***	1.15
Expert promoter (*N* = 150)	**1.18**	.28	.25	.22
Other Promoter (*N* = 295)	.81	**.18**	**.43**	.29
F-Value	9.19***	3.38**	6.26**	1.66
Relationship Promoter (*N* = 60)	.85	**.34**	.40	.33
Other Promoter (*N* = 385)	.94	.22	.36	.26
F-Value	.31	5.09**	.14	.83
Power promoter (*N* = 73)	.53	.16	**.85**	.26
Other Promoter (*N* = 372)	**1.01**	.23	.27	.27
F-Value	9.45***	.83	45.77***	.02
Process promoter (*N* = 68)	.58	.07	.44	**.41**
Other Promoter (*N* = 377)	**1.00**	**.24**	.36	.24
F-Value	6.82**	5.91**	.87	4.85**

* *N* = 445, shaded fields symbolize high cooperation contributions of each promoter

9 Abbreviated version:
(1) exchange of knowledge: (a) assistance by tricky and specialized development tasks, for which only little documented knowledge is available, (b) co-operation in the initial stage of projects, e.g., by the search of ideas, (c) knowledge exchange on job-related technical questions, e.g., on new developments or new solutions, (d) close technical collaboration;
(2) exchange of meaningful opinions : (a) discussion and evaluation of important job-related decisions, (b) confidential discussion of business and/or private matters;
(3) access to legitimate power: (a) most important contacts for further vocational success, (b) acceptance as a direct superior, (c) most important contacts for past vocational career;
(4) exchange of complementary help to achieve objectives: (a) cooperation in the implementation stage of projects, e.g., transferring results into other operational departments, (b) cooperation in the final stage of project, e.g., project management. The name generators are based on the research of Hansen (1999) und Burt (1992).

Table 4 compares the contributions of promotors and champions. The results confirm that champions perform universal roles. In contrast to promotors, champions play multiple roles, and therefore make diverse, and consequently more, contributions: The more work roles a champion owns, the more often he is part of exchanges. The exceptional contributions of champions could be an additional explanation why the Anglo-American studies mainly find proof for the champion concept. Champions are easier observed by third parties than are the specialized promotors.

Table 4: Contributions of promotors compared to contributions of champions

Promoter/Champion	Number of transactions to exchange knowledge	Number of transactions to exchange meaningful opinions	Number of transactions to access legitimate power	Number of transactions to exchange complementary help to achieve objectives
Promoter ($N = 445$)	.93	.22	.37	.27
Champion with 2 roles ($N = 168$)	1.38	.32	.64	.50
Champion with 3 roles ($N = 85$)	2.15	.44	.85	.72
Champion with 4 roles ($N = 73$)	2.04	.53	.93	.79
Champion with 5 roles ($N = 42$)	2.45	.69	1.29	1.00
F-Value	31.43***	10.07***	19.34***	23.32***

Proportion of promotors in networks. We created an overall index to test how promotors respectively champions influence economic progress. This index measures the percentage of promotors in the network of one respondent, compared to all role owners (promotors plus champions). We assigned the value of one to all Alteri which take a promoter role and a value of zero to all Alteri that take a champion role. Afterwards, we calculated an overall index for each ego network. The maximum value of one indicates that a respondent has only promotors within the ego network. The minimum value of zero indicates that a respondent has only champions within the ego network.

Former technological knowledge. We measured the amount of former organizational knowledge within a technology area and extent of uncertainty within this technology area via the following questions, using a Likert scale. "Fast growing amount of technological knowledge within the technology area" (value of one) or rather "few documented technological knowledge within the technology area" (value of seven). "Specialized technological improvements within the technology area" (value of one) or rather "uncertain technological changes within the technology area" (value of seven). We calculated an overall index. Higher values indicate less available and less certain knowledge within the technological area[10].

10 For measurement, see Winter (1987), Hansen (1999), Turner and Makhija (2006). High values indicate a vague optimization of the offering by the inventors. The parties share little common information on how knowledge should be produced (uncertainty with fast technological change) and overall few common skills, as only little documented knowledge is available (available amount of technological knowledge).

5.3. Measurement of the Dependent Variables

We used measures of the respondent's past knowledge creation, since a scarce amount of new knowledge with a high assessed market value can only be measured retroactively. Our knowledge measurements are widely accepted: patents reflect the criteria of novelty, inventive activity, and commercial applicability. We looked only at patents that were announced by the respondent's institution. We do not consider private registrations or patent applications for other institutions. We measured new knowledge directly by previous revenues from patents and indirectly over the number of patents and the technological impact of these patents. The novelty of the underlying technology reflects a long-time measurement. Radical innovation is often based on new technologies that will meet the demand years later[11].

Number of patents. The number of patents measures the quantity of new, commercially applicable knowledge of an R&D-employee that is based on an inventive activity. This indicator does not assign a value to the specific quality of knowledge.

Economic impact of patents. We asked what the average annual amount of inventor remuneration was that an R&D employee received from his company in the last two years (rating scale: one = none, six = more than €10,000 per year). The inventor remuneration is prescribed by the German legislation. The inventor must be given a percentage of the corporate profits from his patents. If small turnovers are realized, then the inventor receives a fixed inventor's bonus. If there is high turnover, the inventor receives a turnover-related remuneration[12].

Technological impact of patents. We used external patent data to measure the technological novelty of patents. We calculated the number of directly received citations on company patents (EP_i) of an inventor i. This index indicates in what respect the underlying technologies of patents were significant for other developments. Patent citations are based on the statements of an independent examiner. We limited the period of the citations per patent EP_i to four years after publication, since older patents are cited with a higher probability. To compare inventors with different work experiences, we calculated the average annual number of citations for each inventor. We divided the number of patents by the years of work experience T_i'[13].

11 The use of patents in the industrial economics is documented by Scherer (1982), Griliches (1990), Harhoff and Reitzig (2001). We checked via publicly available information on the patent date which patents of a respondent were applied by his employer. The difference between technology and market aspects of new knowledge is discussed in detail by e.g., Danneels and Kleinschmidt (2001).

12 A fixed inventor's bonus denotes the requirement on appropriate remuneration if the company uses the invention only to a small extent. The payment is effected after disclosure and amounts to max. 500,- EUR for single inventors (see § 2,4,5,6,9,10 of ArEG). Turnover-related remunerations are based on a considerable use of the invention by the enterprise. It is calculated based on the annual sales multiplied by the royalty rate multiplied by a portion factor (see § 2,4,5,6,9,10 of ArbEG).

13 We only considered direct citations. For a discussion on the advantages and disadvantages of considering indirect citations see von Wartburg et al. (2005). We exclude non-European patents because of they could not be compared.

$$patent\_impact_i = \sum_{ep=1}^{EP_{iT}} \sum_{t'=t}^{t+3} cit_{ipt'} * \left[\frac{\sum_{ep=1}^{EP_{iT}}}{T_i^{'}} \right]$$

A disadvantage of our research design is that the dependent variables for knowledge are based on previous success, but the independent variables, i.e., the proportion of promotors/champions in ego networks, were asked at a later time. In regression analyses, only those actors may effect knowledge generation who were employed in the company at the time, whereas the knowledge was invented. This assumption is realistic for our sample: the respondents know 86% of all named contacts longer than five years and 53% even longer than ten years.

5.4 Measurement of Control Variables

We controlled for the following personal characteristics of the respondent: Years of work experience within the current technology area,[14] years of miscellaneous work experience, leading position in the company (zero = "none/ little co-worker responsibility", one = "medium/ large co-worker responsibility"), technological specialization (overall index of the items: one = "expert in one technological area," seven = "expert in various technological areas"; one = "technical and/or procedure specialist," seven = "all-rounder in various technologies/ procedures"), self-practice of a promoter/champion role (15 items to the five normative role types, in each case three items per role type; one = respondent exercises at least one work role; zero = respondent exercises no work role), and portion of single inventions (measured by external patent data, index reaches maximally the value one if all patents represent single inventions[15]).

We also controlled for the following aspects of the work environment: The number of informal role owners in the network of the respondent, the number of the remaining network contacts (based on the name generators of all job-related contacts, i.e., other persons who contribute to the innovation process). *Table 5* shows the statistics of the variables.

14 85% of all respondents have a university degree. Consequently, it is not necessary to control for this variable.

15 The index shows for the last 10 years how many additional inventors N contributed to the patent EPi of the inventor i. If several persons contributåed to a patent, it is not fully attributed to the inventor i but rather the reciprocal value of the total number of partners N. Finally, we calculated an average index for all patents of an inventor i.

Table 5: Descriptive statistics of the indexes (*N* = 136)

Variables	Min.	Max.	Mean	Std.dev.	Skewness	Kurtosis
Number of patents	1.00	136.00	18.66	23.79	2.70	9.05
Economic impact of patents	1.00	6.00	3.51	1.44	1.27	.93
Technological impact of patents	.00	79.00	12.54	18.12	1.86	2.96
% of promotors in networks	.00	1.00	.47	.28	–.21	–.86
Former technological knowledge	1.00	6.50	3.81	1.39	.31	–.63
Technological work experience	1.00	38.00	11.46	9.00	1.15	.46
Miscellaneous work experience	0.00	36.00	9.83	8.36	.75	.02
Leading position	.00	1.00	.39	.49	.46	–1.81
Technological specialization	.50	13.00	4.43	2.95	1.09	.92
Self-practice of a promoter/champion role	.00	1.00	.40	.49	.40	–1.85
Portion of single inventions	.33	1.00	.75	.25	–.27	–1.59
Network size of promoter/champions	1.00	23.00	7.11	4.41	1.41	1.93
Network size minus promoter/champions	1.00	22.00	8.51	4.37	.74	.53

5.5 Method of Analysis

We analyzed the pros and cons of promotors compared to champions by the interaction between the previous technological knowledge and the proportion of promotors in networks on knowledge generation. Without this interaction, the amount of specialization in networks, i.e., the proportion of promotors in networks should have only weak effects on knowledge generation. Considering the interaction between previous knowledge and the amount of specialization, we expected to find significant and opposite effects. We looked for a positive main effect of the proportion of promotors in networks and a negative interaction effect of the proportion of promotors in the network, simultaneously considering the amount of previous knowledge. The proportion of promotors should positively affect the generation of knowledge. However, this effect presupposes that much previous knowledge is available within a technological area. If there is a lower degree of previous knowledge within a technological area, then we expect that a high proportion of promotors hinder the knowledge generation of an employee.

We predict the dependent variable inventor remuneration using an OLS test. The dependent variable patent output represents an uncensored count variable, as all inventors own at the least one patent. To predict the patent output we used a Poisson regression. For the dependent variable patent impact we observe a truncated distribution: approximately 40% of the inventors are involved in patents which are never cited.

The remaining inventors receive an average of 21 citations per patent. Thus, the variable patent impact represents a censored variable and can be predicted by using a Tobit regression (maximum likelihood estimation). We confirmed the results of the Tobit regression by means of an alternative estimation procedure, the negative binomial regression (Fleming and Sorenson (2004)).

6 Empirical Results

We conduct a step-wise analysis. In a first step, we enter all variables without the interaction terms (model 1 in *table 6*) and in our second step, all variables considering the interaction terms (model 2 in *table 6*). The results in model 1 indicate that the proportion of promotors only slightly influences the knowledge generation of a respondent. The proportion of promotors is significantly and positively related to the number of patents. Thus, the number of specialized promotors seems to support the number of inventions more than do the number of generalized champions.

The findings in model 2 that consider the interaction terms demonstrate that the proportion of promotors is significantly and positively related to the knowledge generation of the respondent. These effects are significant in all models except for the negative binomial regression. The regression coefficients of the proportion of promotors are 0.34 for the number of patents $(p < 0.001)$, 20.1 for the technological impact of patents $(p < 0.05)$, and 10.78 for the economic impact of patents $(p < 0.001)$. In addition, the data supports the fact that in the case of less and uncertain previous knowledge, a high proportion of promotors prevents the knowledge generation. We find several robust moderation effects, that is, previous knowledge consistently alters the usefulness of promotors. The regression coefficients of the interaction between the amount of previous knowledge and the proportion of promotors are –0.81 for the number of patents $(p < 0.001)$, –27.05 $(p < 0.001)$ and –0.68 $(p < 0.1)$ for the technological impact of patents, and –2.41 for the economic impact of patents $(p < 0.001)$. Overall, our findings confirm the idea that for incremental innovation, promotors are better suited to fostering the economic progress within organizations, but for radical innovation, champions are better suited to fostering the economic progress within organizations.

Our results also show that the knowledge generation is higher in technological areas where there is little previous knowledge. We do not consider the alternating algebraic signs of the control variables. The causes are explained in more detail by Rost (Rost (2006)).

7 Discussion & Implications

Our empirical results confirm the assumption that both promotors and champions are a fundamental part of organizations. Both promotors and champions support the knowledge generation of other employees by promoting innovations through the crucial organizational stages. Whether promotors or champions are better or worse is determined by the amount of the previous knowledge in the industry. If organizations only refine and improve an existing design, then promotors are more qualified. In advanced technologies, specialized employees with deep basic knowledge, i.e., component knowledge, recognize opportunities better than do generalized employees with broad marginal knowledge, i.e., architectural knowledge. This is the reason why champions are less suited to reduce the barriers against incremental innovation. If economic progress cannot build on previous knowledge and organizations introduce a new concept that differs in a significant way from past practice, then champions are more capable. Champions possess a high amount of architectural or general knowledge and are therefore better positioned to reduce the barriers against radical innovation, i.e., to reduce the decision-making problems between the diverse parties.

In summary, the champion approach and the promoter approach are part of the same phenomenon: both work roles actively and enthusiastically promote innovations. The advantages of one over the other depend on the character of economic progress within an industry. Anglo-American studies apparently focus more on radical innovation and therefore observe the successful "great man", i.e., the champion. German-speaking studies based on Witte focus more on incremental innovation and favour the division of labour, i.e., promotors.

Finally, we ask what organizations can learn from informal work roles. Practitioners often ignore informal work roles as they appear irrelevant to managerial practice. Traditional command-and-control systems seem to ensure rule-following and apparently regulate employees' performance well enough. So far, only researchers discuss how to search for, find, and foster promotors or champions. Nevertheless promotors, champions, and other voluntary behaviors occur in organizations, and research consistently confirms that especially informal organizational structures support innovations. The fact that command-and-control systems are not very effective for innovating is hardly surprising; given that research on promotors and champions shows that these helping behaviors are typically volunteered. The question of how the existing organizational structure can enhance innovation is unclear. In principle, it is not the job of promotors and champions to overcome barriers of other employees. However, it is obvious that managers fulfil this task only suboptimally (e.g. Hauschildt (2004)). Nevertheless, it is not enough to highlight the advantages of informal structures and the disadvantages of formal structures. Researchers must also show alternative command-and-control systems that optimally support innovations. The search for alternative command-and-control systems calls for further research. It seems that organizations are between the devil and the deep blue sea: tough informal structures foster innovations, but they are not a systematic part of the command-and-control system. Tough formal structures steer the organization, but they undoubtedly prevent innovations.

Table 6: Regression results (*N* = 136)

Variables:	Number of patents				Technological impact of patents								Economic impact of patents			
	PoissonRegression				Tobit Regression				Negative binomial regression				OLSTests			
	Model 1		Model 2		Model 1		Model 2		Model 1		Model 2		Model 1		Model 2	
	Coef.	|*z*|	Coef.	|*z*|	Coef.	|*t*|	Coef.	|*t*|	Coef.	|*z*|	Coef.	|*z*|	Coef.	|*t*|	Coef.	|*t*|
Former technological knowledge	.01	.80	.21	7.79***	–.33	.25	2.73	1.58	.01	.08	.09	.70	.00	.02	1.02	4.48***
% of promotors in networks	.71	8.19***	.34	5.79***	2.11	.27	20.10	1.96**	.13	.24	.35	1.46	1.27	2.52	10.78	5.25***
Former techn. knowledge * %			–.81	9.75***			–27.05	2.62***			–.68	1.88*			–2.41	4.75***
of promotors																
Technological work experience	.05	18.92***	.05	19.30***	.16	.66	.08	.32	.01	.73	.01	.62	.03	1.86*	.01	.92
Miscellaneous work experience	.06	21.56***	.06	21.65***	.07	.31	.01	.07	.00	.20	.00	.19	.04	2.80***	.09	5.27***
Leading position	.39	8.81**	.46	10.04**	–7.95	–1.98**	–10.78	2.59**	–.61	2.21**	–.64	2.31**	.78	2.96***	.78	3.20***
Technological specialization	–.52	5.38***	–.33	3.37***	.47	.78	.46	.77	.09	2.06**	.09	2.07**	.05	1.11	.00	.03
Self-practice of a promoter/champion role	.04	7.02***	.05	8.77***	–12.18	3.07***	–13.10	3.33***	–.60	2.31**	–.56	2.14**	.49	1.95*	1.04	4.01***
Portion of single inventions	–.11	2.41***	–.14	3.11***	–26.73	–3.36***	–28.43	3.60***	–2.23	3.70***	–2.23	3.75***	–.47	.89	–.73	1.50
Network size of promoter/champions	–.07	8.85***	–.09	10.99***	1.14	1.80*	1.40	2.20**	.12	2.32**	.13	2.48**	.00	.00	–.01	.46
Network size less promoter/champions	.02	3.63***	.04	6.36***	–.72	1.37	–.95	–1.80*	–.05	1.26	–.06	1.41*	–.01	.41	.06	1.88*
Constant	1.52	10.96***	2.16	13.88***	28.20	2.36*	20.69	1.69*	3.82	4.02***	3.49	3.42***	.93	1.22	–4.29	3.30***
Log likelihood	–1050.85		–1002.66		–827.19		–823.74		–846.55		–844.62					
LR chi2(df)	1066.87***		1163.25***		28.82***		35.72***		23.39***		27.23***					
R2/ Pseudo R2	.34		.37		.02		.02		.01		.02		.22	3.42***	.34	5.72***

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